MDrive® Hybrid

Integrated motion systems with Hybrid Motion Technology™

MDrive 23 Hybrid
Motion Control

IMS
INTELLIGENT MOTION SYSTEMS, INC.

Schneider Electric

MDrive® Hybrid

Motion Control
fully programmable

MDrive® Hybrid Motion Control, fully programmable
Sizes: 17, 23 & 34ac

Ethernet now available

Presentation

The MDrive® Hybrid Motion Control is a very compact motion system that solves many servo applications with a low cost solution. The system includes a 1.8° 2-phase stepper motor integrated with a fully programmable controller, high performance microstepping drive, internal encoder integral to system operation, and Hybrid Motion Technology™ (HMT). HMT combines the best of servo and stepper motor technologies, while delivering unique capabilities and enhancements over both. These stand-alone motion control solutions can be used without any external controller.

With MDrive Hybrid integrated motion control systems, point-to-point positioning, torque mode and velocity control are all user programmed with pre-installed MCode software, a simple language that uses 1 to 2 character instructions, and an easy-to-use terminal emulator program that is provided. Communication is via RS-422/485 or Ethernet. *(1)*

MDrive Hybrid systems with Ethernet are programmed with the same MCode instruction set used for the RS-422/485 products. Ethernet products also support MODBUS/TCP application protocol, per specification Version 1.1b, with operation in immediate mode, not as programmable products.

A USB to RS-422/485 Communications Converter is available for ease of connecting to a user's PC. Connectivity options range from all-inclusive QuickStart Kits to individual interfacing cables and mating connector kits to build your own cables.

Application areas

The MDrive Hybrid is ideal for machine builders who want a low cost alternative to servo motors and brushed DC motors. The highly compact, integrated electronics of the MDrive Hybrid reduce the potential for problems due to electrical noise by eliminating the cable between motor and drive. This stepper-based system requires no tuning, and provides real-time closed loop control through an internal encoder.

These compact, powerful and cost effective motion control solutions deliver unsurpassed smoothness and performance that will reduce system cost, design and assembly time for a large range of motor applications — both servo and stepper.

Features

- Highly integrated microstepping drive and high torque 1.8° 2-phase stepper motor
- Fully programmable motion controller
- HMT control for exceptional performance
- Internal encoder
- Single supply: from +12 up to +75 VDC or 120 and 240 VAC
- Cost effective
- Extremely compact
- 20 microstep resolutions up to 51,200 steps per rev including: Degrees, Metric, Arc Minutes
- Several motor stack lengths available
- Available options:
  - Long life linear actuator *(2)*
  - Rear control knob for manual position
  - QuickStart Kit
  - Drive Protection Module
- Graphical user interface provided for quick and easy configuration and programming

(1) Ethernet only available with MDrive 23 Hybrid systems.
(2) Only available with MDrive 23 Hybrid systems. See separate documentation.

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Motion Control specifications

			MDrive 17	MDrive 23	MDrive 34ac	
Input power	Voltage	VDC	12 to 48	12 to 60	—	—
		VAC	—	—	120	240
	Current maximum *(1)*		2.0A	3.5A	95 to 132 VAC @ 50/60 Hz	95 to 264 VAC @ 50/60 Hz
Thermal	Operating temp non-condensing	Heat sink	–40° to +85°C	–40° to +85°C	–40° to +75°C	
		Motor	–40° to +100°C	–40° to +100°C	–40° to +90°C	
	Open-drain type		not applicable	not applicable	+5 to +24 VDC, 50 mA current	
Protection	Type		over temperature, short circuit, transient over voltage, over voltage, inductive clamp			
Auxiliary logic input	Voltage range *(2)*		+12 to +24 VDC			
Analog input	Resolution		10 bit			
	Voltage range		0 to +5 VDC, 0 to +10 VDC, 0-20 mA, 4-20 mA			
General purpose I/O	Number		8			
	Type		sourcing or sinking outputs/inputs			
	Logic range		Sourcing outputs +12 to +24 VDC			
			Inputs and sinking outputs tolerant to +24 VDC, inputs TTL level compatible			
	Output sink/source current		Up to 600 mA per channel			
	Protection		Over temp, short circuit, transient, over voltage, inductive clamp			
Communication	Type		RS-422/485 or Ethernet *(3)*			
	Baud rate		4.8 to 115.2 kbps *(4)*			
Motion	Closed loop configuration with encoder		Encoder type	Internal, magnetic		
			Steps per revolution	51200		
			Encoder resolution	1000 lines/4000 edges per rev		
	Counters		Type	position, encoder/32 bit		
			Edge rate maximum	5 MHz		
	Velocity		Range	+/– 5,000,000 steps per second		
			Resolution	0.5961 steps per second		
	Accel/Decel		Range	1.5×10^9 steps per second^2		
			Resolution	90.9 steps per second^2		
	High speed I/O		Position capture	Input filter range	50 nS to 12.9 µS (10 MHz to 38.8 kHz)	
				Resolution	32 bit	
			Trip Output	Speed/resolution/threshold	150 nS/32 bit/TTL	
Software	Program storage		Type/size	flash/6384 bytes		
	User registers		Four 32 bit			
	User program labels & variables		192			
	Math functions		+, –, ×, ÷, >, <, =, <=, >=, AND, OR, XOR, NOT			
	Branch functions		Branch and Call			
	General purpose I/O functions		Inputs	home, limit plus, limit minus, go, stop, pause, jog plus, jog minus, general purpose		
			Outputs	moving, fault, stall, velocity change, general purpose		
	Trip functions		Trip on input, trip on position, trip on time, trip capture, trip on relative position			
	Party mode addresses		62 *(4)*			
	Encoder functions		Find index			

(1) Actual power supply current will depend on voltage and load.
(2) When input voltage is removed, maintains power only to control and feedback circuits.
(3) Ethernet only available with MDrive 23 Hybrid systems.
(4) Only with RS-422/485 systems.

Programming

RS-422/485 MDrive Hybrid systems

Fully programmable. Users can quickly communicate and program via a PC using IMS Terminal, an integrated ASCII terminal emulator and program editor available for download at www.imshome.com.

Ethernet MDrive Hybrid systems

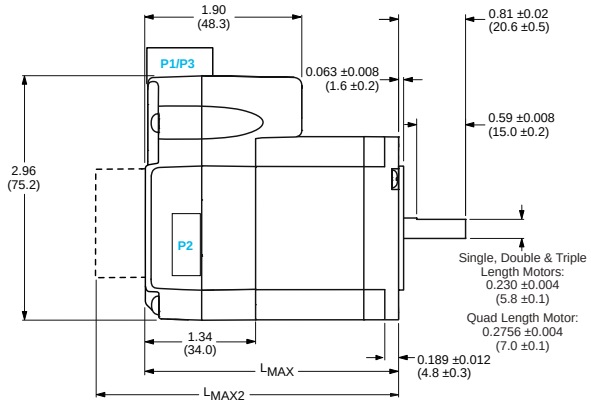
These products support two protocols in a single package:

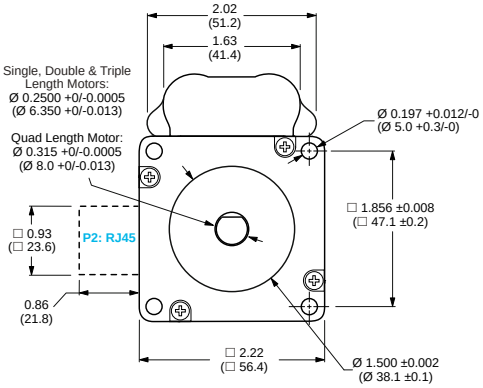
MCode/TCP — These fully programmable systems utilize Schneider Electric Motion USA's proprietary MCode programming language, developed for MDrive Motion Control products, which has been adapted to utilize TCP/IP message formatting.

MODBUS/TCP — A standard open industrial protocol supported by a variety of machine components such as programmable controllers, drives and controls, I/O modules and switches.

See User Manual for complete details: www.imshome.com/manuals.html

Mechanical specifications, dimensions in inches (mm)

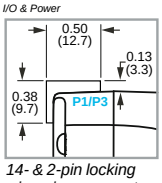




Motor stack length	Lmax *(1)*	Lmax2 *(2)*
Single	2.65 (67.31)	3.36 (85.34)
Double	3.02 (76.71)	3.73 (94.74)
Triple	3.88 (98.55)	4.59 (116.59)
Quad	5.28 (134.15)	5.99 (152.19)

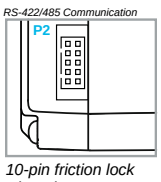
(1) Single shaft.
(2) Control knob.

P1/P3 connectors

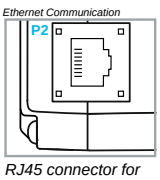


14- & 2-pin locking wire crimp connectors

P2 connectors

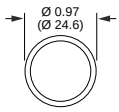


10-pin friction lock wire crimp connector



RJ45 connector for Ethernet only

Lmax2 option



control knob

See User Manual for complete details: www.imshome.com/manuals.html

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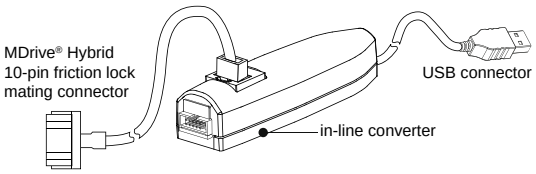
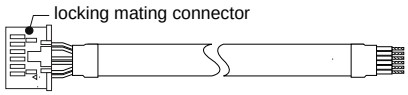
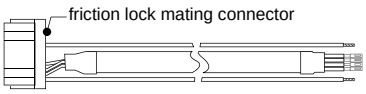


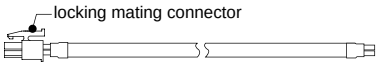
MD-CC402-001



PD14-2334-FL3



PD10-1434-FL3



PD02-2300-FL3

Installation accessories

Description	Length feet (m)	Part number
QuickStart Kit		
For rapid design verification, all-inclusive QuickStart Kits include connectivity, instructions and CD for MDrive Hybrid initial functional setup and system testing.		
■ For all MDrive23 Motion Control systems	—	**add "K" to part number** *(1)*
Communication converter		
Electrically isolated, in-line converter pre-wired with mating connector to conveniently set/ program communication parameters for a single MDrive Hybrid via a PC's USB port.		
■ Mates to 10-pin friction lock wire crimp connector	12.0 (3.6)	**MD-CC402-001**
Prototype development cable		
Speed test/development with pre-wired mating connector with other cable end open.		
■ Mates to 14-pin locking wire crimp connector for I/O	10.0 (3.0)	**PD14-2334-FL3**
■ Mates to 10-pin friction lock wire crimp connector for communication	10.0 (3.0)	**PD10-1434-FL3**
■ Mates to 2-pin locking wire crimp connector for power	10.0 (3.0)	**PD02-2300-FL3**
Mating connector kit		
Connectors for assembly of cables, cable material not supplied. Sold in lots of 5. Manufacturer's crimp tool recommended for crimp connectors.		
■ 14-pin locking wire crimp connector for I/O	—	**CK-09**
■ 10-pin friction lock wire crimp connector for communication	—	**CK-02**
■ 2-pin locking wire crimp connector for power	—	**CK-04**
Drive protection module		
Limits surge current and voltage to a safe level when DC input power is switched on-and-off to an MDrive Hybrid.		
■ For all MDrive23 Motion Control systems	—	**DPM75**

(1) See page 28.

Connectivity details: www.imshome.com/connect.html

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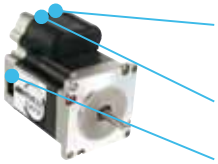


P1: I/O
C = 14-pin locking wire crimp connector

P3: Power
2-pin locking wire crimp connector

P2: Communication
L = RS-422/485 with 10-pin friction lock wire crimp connector
R = Ethernet with RJ45 locking connector

Motion Control Part numbers														
Example:	**K**	**M**	**A**	**I**	**3**	**C**	**R**	**L**	**2**	**3**	**A**	**6**	**–EJM**	**–N**
QuickStart Kit **K** = kit option, or leave blank if not wanted	**K**	M	A	I	3	C	R	L	2	3	A	6	–EJM	–N
MDrive Hybrid version **MAI** = Motion Control	K	**M**	**A**	**I**	3	C	R	L	2	3	A	6	–EJM	–N
Type **3** = HMT	K	M	A	I	**3**	C	R	L	2	3	A	6	–EJM	–N
P1 connector **C** = wire crimp	K	M	A	I	3	**C**	R	L	2	3	A	6	–EJM	–N
Communication **R** = RS-422/485 **E** = Ethernet	K	M	A	I	3	C	**R**	L	2	3	A	6	–EJM	–N
P2 connector **L** = wire crimp **R** = RJ45 *(1)*	K	M	A	I	3	C	R	**L**	2	3	A	6	–EJM	–N
Motor size **23** = NEMA 23 (2.3" / 57 mm)	K	M	A	I	3	C	R	L	**2**	**3**	A	6	–EJM	–N
Motor length **A** = single stack **B** = double stack **C** = triple stack **D** = quad stack	K	M	A	I	3	C	R	L	2	3	**A**	6	–EJM	–N
Drive voltage **6** = +12 to +60 VDC	K	M	A	I	3	C	R	L	2	3	A	**6**	–EJM	–N
Encoder, differential **–EJM** = 1000-line internal encoder	K	M	A	I	3	C	R	L	2	3	A	**6**	**–EJM**	–N
Option Leave blank if not wanted **–N** = rear control knob for manual positioning														**–N**

(1) Only available with systems with Ethernet protocol.

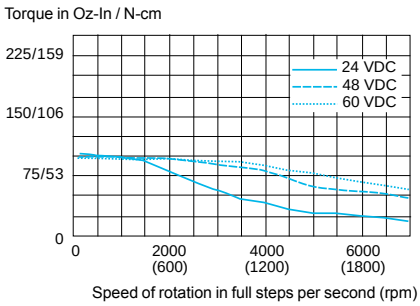
Easy MDrive part numbers via an interactive tool at:
www.imshome.com/MDrivePlus.html

Motor specifications MDrive 23 Hybrid

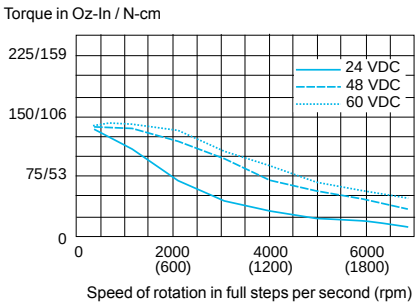
		Holding torque	Detent torque	Rotor inertia	Weight (motor + driver)
Motor stack length	Single	90.0 oz-in / 64.0 N-cm	3.9 oz-in / 2.7 N-cm	0.0025 oz-in-sec^2 / 0.18 kg-cm^2	21.6 oz / 612.3 g
	Double	144.0 oz-in / 102.0 N-cm	5.6 oz-in / 3.92 N-cm	0.0037 oz-in-sec^2 / 0.26 kg-cm^2	26.4 oz / 748.4 g
	Triple	239.0 oz-in / 169.0 N-cm	9.7 oz-in / 6.86 N-cm	0.0065 oz-in-sec^2 / 0.46 kg-cm^2	39.2 oz / 1111.3 g
	Quad	283.0 oz-in / 200.0 N-cm	14.2 oz-in / 10.0 N-cm	0.0108 oz-in-sec^2 / 0.76 kg-cm^2	61.6 oz / 1746.3 g

Speed torque characteristics MDrive 23 Hybrid

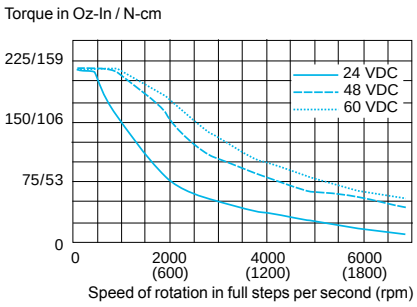
Single stack length



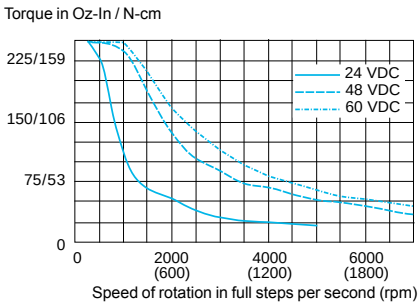
Double stack length



Triple stack length



Quad stack length



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